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## NOTES ON THE CLADONIAE OF CONNECTICUT—II<sup>1</sup>

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A report on the Cladoniae of Connecticut, which was based on collections made down to the close of 1928, was published by the writer in 1930.<sup>2</sup> This report was supplemented two years later by a series of notes, which gave the results of explorations made in various parts of the State during the years 1929, 1930, and 1931, together with revisions of certain earlier records.<sup>3</sup> The present series of notes represents a second supplement to the report. Although based largely on collections made in 1932 and 1933, it lists a few specimens of earlier date, in some cases correcting or revising published records. In the preparation of these notes the writer has again been privileged in having the kind coöperation of Dr. Heinrich Sandstede of Bad Zwischenahn, Oldenburg. Dr. Sandstede has determined many of the specimens listed and has examined most of the others. The writer would again express to him his grateful appreciation.

The writer is indebted also to the following botanists, who have kindly submitted specimens of Connecticut Cladoniae for determination: Mrs. J. W. Black of Mt. Carmel, Mr. B. Hartwell Clark of Hartford, Miss Margaret Fulford of Cincinnati, Mr. Ray Hansbrough of New Haven, Mrs. J. E. Hobbs of Mt. Carmel, Mr. A. D. McDonnell of New Haven, Mrs. F. H. Paine of Pomfret, and Mr. Jesse F. Smith of Suffield. In several instances these specimens have come from

<sup>1</sup> Contribution from the Osborn Botanical Laboratory. Published with aid to RHODORA from the National Academy of Sciences.

<sup>2</sup> Trans. Connecticut Acad. 30: 357-510. 1930.

<sup>3</sup> Notes on the Cladoniae of Connecticut. RHODORA 34: 121-142, 153-164. 1932.

towns which the writer has not yet been able to visit and have thus appreciably added to our knowledge of local distribution within the State.

Two papers have recently been published which have a bearing on the Cladoniae of Connecticut. The first is by Kušan and deals with the species of the subgenus *Cladina* occurring in Jugoslavia.<sup>1</sup> These species are identical with the six recorded for Connecticut, but Kušan recognizes the specific validity of only three: *C. rangiferina*, *C. sylvatica*, and *C. alpestris*. He reduces the other three species to varietal rank under *C. sylvatica* and regards the true *C. sylvatica*, according to the definition of Sandstede, as a fourth variety. The true *C. sylvatica*, therefore, in Kusan's arrangement, becomes *C. sylvatica* var. *cusylvatica* Kušan, and the other three species become var. *mitis* (Sandst.) Kušan, var. *tenuis* (Harm.) Kušan, and var. *impexa* (Harm.) Kušan, respectively. He thus distinguishes the same taxonomic entities that Sandstede recognizes but gives some of them a more subordinate rank. In a general way his broad conception of *C. sylvatica* is in accordance with the views of Vainio. The segregations from this species, however, which we owe to the studies of Harmand and Sandstede, are becoming more and more widely recognized, and both *C. mitis* and *C. tenuis* are still listed below as distinct species; *C. impexa*, unfortunately, has not been collected in Connecticut during the past two years.

The other paper, which is more popular in character, is by Torrey and discusses the "Cladoniae in the range of the Torrey Botanical Club."<sup>2</sup> The region in question includes "New Jersey, eastern Pennsylvania, Long Island, and the Hudson Valley in New York as far north as the Catskills." Of the forty-three species recognized all but four have been reported from Connecticut. The paper gives keys to the groups and species represented, together with numerous descriptive and distributional notes; and the accompanying plates include illustrations of thirty-five species, several of which are represented by more than one form.

Forty-nine species of *Cladonia* were reported from Connecticut in 1932. In the present paper 4 additional species are reported, giving a new total of 53 species for the State. One species, unfortunately, which was included in the writer's original report, can

<sup>1</sup> Über die angebliche *Cladonia pycnoclada* (Gaudich.) Nyl. in Jugoslawien mit besonderen Berücksichtigung der nabestehenden Formen. *Hedwigia* 72: 42-54. 1932.

<sup>2</sup> *Torreya* 33: 109-129. pl. 1-4. 1933.

no longer be considered a member of the Connecticut flora. This species is the widely distributed *C. cariosa* (Ach.) Spreng., which was recorded from Killingworth on the basis of a single collection made by Hall in 1874. Hall's material, when treated with KOH, fails to give the yellow color characteristic of *C. cariosa* and should, in the opinion of Dr. Sandstede, be referred to *C. alpicola* f. *minor*, under which name it is listed on page 49. Since *C. alpicola* is new to Connecticut, the total of 53 species for the State is not affected.

The sequence adopted in the present series of notes is the same as in the 1932 series and in the 1930 report; and all page-references, unless otherwise indicated, refer to this report. The 1932 series of notes is indicated by the word "Notes," and all species or forms reported for the first time from Connecticut are marked with asterisks. Stations listed with dates alone refer to collections made by the writer; in all other cases both dates and collector's names are given. Specimens from all the stations listed are preserved in the herbarium of Yale University.

#### Subgenus CLADINA

CLADONIA RANGIFERINA (L.) Web. (p. 375; Notes, p. 122). Avon (1933), Burlington (1933), Canton (1933), Cheshire (1932), East Haddam (*Hansbrough*, 1933), Guilford (1932), Hebron (1933), Lebanon (1932), Litchfield (1933), Marlboro (1933), Meriden (1933), and Simsbury (1933).

CLADONIA RANGIFERINA f. TENUIOR (Del.) Mass. (Notes, p. 122). Burlington (1933) and Middletown (1932), both determined by Sandstede.

CLADONIA RANGIFERINA f. CRISPATA Coem. (p. 377; Notes, p. 122). Cheshire (1932) and Middletown (1932), both determined by Sandstede.

\*CLADONIA RANGIFERINA f. HUMILIS Anders, Mitt. Nordböhm. Ver. Heimatsforsch und Wanderpflege 40: 69. 1917; Hedwigia 61: 356. 1920. On exposed banks, Middlefield (1932, det. Sandstede). First record for North America.

The podetia are darkened by the sunlight and form small depressed colonies, which have a more or less circular outline.

\*CLADONIA RANGIFERINA f. UMBELLATA Anders, Strauch- und Laubfl. Mitteleuropas 54. pl. 5, f. 1. 1928. On earth in open fields. Hartland (1933) and Simsbury (1933). The latter specimen was determined by Sandstede and represents the first record for Connecticut. New to North America.

The ultimate branchlets in f. *umbellata* are arranged in radiating whorls around gaping axils. These branchlets, for the most part, are

straight or only slightly curved, instead of being distinctly curved in one direction, as in the usual forms of the species.

\*CLADONIA RANGIFERINA f. PATULA Flot. in Sandstede, Abhandl. Naturw. Ver. Bremen **25**: 98. 1922; Rabenhorst, Kryptogamen-Flora **9**, Abt. 4<sup>2</sup>: 35. *pl. 1, f. 6*. 1931. On earth in field, Hartland (1933, det. Sandstede). First record for North America.

The podetia of f. *patula* are characterized by bearing spermagonia in abundance. These are very dark in color and terminate branchlets surrounding open axils. In the preceding form the ultimate branchlets are mostly sterile.

\*CLADONIA RANGIFERNA f. SETIGERA Oxner in Sandstede, Clad. Exsic. Bericht. Uebersicht 34. 1930; Rabenhorst, Kryptogamen-Flora **9**, Abt. 4<sup>2</sup>: 38. *pl. 1, f. 3*. 1931. In open woods, Simsbury (1933, det. Sandstede). New to North America.

The hair-like or bristle-like outgrowths found in f. *setigera* are scattered or fasciculate and vary in color from whitish to blackish. They are particularly in evidence at the tips of spermagonial branchlets. The form is a homologue of *C. tenuis* f. *setigera*.

CLADONIA SYLVATICA (L.) Hoffm. (p. 378; Notes, p. 123). Avon (1933), Canterbury (1933), Canton (1933), East Hampton (*McDonnell*, 1932, det. Sandstede), Griswold (1933), Guilford (1932, det. Sandstede), Killingworth (*Hall*, 1874, det. Sandstede, not previously reported; *Evans*, 1932), Middletown (1932), and Voluntown (1933).

\*CLADONIA SYLVATICA f. SCABROSA Leight. Lichen-Flora Great Britain, etc. 66. 1879. On earth in field, Hartland (1933, det. Sandstede). First record for North America.

The podetial surface in f. *scabrosa*, especially in the older parts, is densely verruculose. This condition is apparently associated with old age.

CLADONIA SYLVATICA f. PYGMAEA Sandst. (p. 381; Notes, p. 123). Killingworth (1932).

CLADONIA SYLVATICA f. SPHAGNOIDES (Floerke) Oliv. (p. 380). East Haddam (1933).

CLADONIA MITIS Sandst. (p. 381; Notes, p. 123). Barkhamsted (*McDonnell*, 1933, det. Sandstede), Canterbury (1933, det. Sandstede), Cheshire (1932), Durham (1932), East Haddam (1933), Griswold (1933), Hebron (1933), Killingworth (1932), Milford (1932), Portland (1932), Simsbury (1933), Suffield (*Smith*, 1933), Wallingford (1932), Windsor (1933), and Wolcott (1933).

CLADONIA MITIS f. DIVARICATA Sandst. (p. 383). Avon (1933, det. Sandstede), East Hampton (1932), Franklin (1932), Killingworth (1932), Middletown (1932), and Simsbury (1933).

CLADONIA MITIS f. PROLIFERA Sandst. (p. 383; Notes, p. 123).

Avon (1933, det. Sandstede), Cheshire (1932), Franklin (1932), Guilford (1932), Hebron (1933), and Killingworth (1932).

\*CLADONIA MITIS f. SORALIFERA Sandst. Abhandl. Naturw. Ver. Bremen **25**: 111. 1922 (as modification); in Rabenhorst, Kryptogamen-Flora **9**, Abt. 4<sup>2</sup>: 61. pl. 3, f. 3. 1931 (as form). Sand plain, North Haven (*Miss Fulford*, 1932). This interesting form was collected by Robbins at Wareham, Massachusetts, in 1924, but no record for North America has heretofore been published.

The soredia, which are characteristic of f. *soralifera*, are grayish or yellowish in color and form conspicuous but irregular masses on the surface of the podetia. The plants bearing the soredia are prostrate or ascending and present the appearance of being poorly developed. *Cladonia mitis* is a species which does not usually produce soredia. In commenting on the sorediose forms of such species Du Rietz<sup>1</sup> notes that they are apparently constant in character, since they grow mixed with plants lacking soredia. He brings out the difficulty of deciding whether they arise by mutation or otherwise and emphasizes their failure to reproduce efficiently. This has prevented them from becoming independent species.

CLADONIA TENUIS (Floerke) Harm. (p. 384; Notes, p. 123). Avon (1933), Burlington (1933), Canterbury (1933), Canton (1933), Cheshire (1932), Franklin (1932), Griswold (1933, in part det. Sandstede), Harwinton (1933), Killingworth (1932), Lebanon (1932), Marlboro (1933), Meriden (1933), Middlefield (1932), Middletown (1932), Monroe (1933), Simsbury (1933), Southington (1932), Stafford (1932), Suffield (*Smith*, 1933), Voluntown (1933, det. Sandstede), Willington (1932), and Wolcott (1933).

CLADONIA TENUIS f. SETIGERA Sandst. (Notes, p. 123). Burlington (1933), Canterbury (1933), Franklin (1932), Griswold (1933), Marlboro (1933), Simsbury (1933), Voluntown (1933), and Wethersfield (*Clark*, 1933).

CLADONIA TENUIS f. PROLIFERA Sandst. (Notes, p. 123). Harwinton (1933).

#### Subgenus PYCNOTHELIA

CLADONIA PAPILLARIA (Ehrh.) Hoffm. f. MOLARIFORMIS (Hoffm.) Schaer. (p. 390; Notes, p. 123). Avon (1933), Burlington (1933), Cheshire (1932), Franklin (1932), Griswold (1933), Meriden (1933), Milford (1932), Simsbury (1933), and Willington (1932).

CLADONIA PAPILLARIA f. STIPATA Floerke (p. 391; Notes, p. 123), Killingworth (1932) and Madison (1933).

CLADONIA PAPILLARIA f. PAPILLOSA Fr. (p. 391; Notes, p. 123). Burlington (1933), East Haddam (1933), Franklin (1932), Griswold (1933), Meriden (1933), Simsbury (1933), and Willington (1932).

<sup>1</sup> Svensk Bot. Tidskr. **18**: 388. 1924.

CLADONIA PAPILLARIA f. PROLIFERA Schaer. (Notes, p. 124). Hamden (*Mrs. Hobbs*, 1933).

### Subgenus CENOMYCE

#### Section COCCIFERAE

#### Subsection SUBGLAUDESCENTES

CLADONIA FLOERKEANA (Fr.) Floerke var. CARCATA (Ach.) Vainio (p. 394; Notes, p. 124). Harwinton (1933) and Voluntown (1933).

CLADONIA FLOERKEANA var. INTERMEDIA Hepp (p. 393; Notes, p. 124). Canton (1933), Hartland (1933), Harwinton (1933), Voluntown (1933), and Wolcott (1933).

CLADONIA BACILLARIS (Ach.) Nyl. (p. 395; Notes, p. 124). Barkhamsted (1933), Burlington (1933), Canterbury (1933), Canton (1933), Griswold (1933), Harwinton (1933), Hebron (1933), Killingworth (1932), Marlboro (1933), Middletown (1932), Monroe (1932), Portland (*Evans*, 1933; *Clark*, 1933), Simsbury (1933), Trumbull (1933, det. Sandstede), Voluntown (1933), and Wolcott (1933).

CLADONIA BACILLARIS f. CLAVATA (Ach.) Vainio (p. 397; Notes, p. 124). Bristol (1933), Burlington (1933), Canton (1933), East Haddam (1933), Franklin (1932), Harwinton (1933), Salisbury (1932, det. Sandstede), Simsbury (1933), and Thomaston (1933).

\*CLADONIA BACILLARIS f. MONSTROSA Harm. Lich. France **3**: 337. 1907. On soil over wood, Guilford (*Miss Fulford*, 1932, det. Sandstede). First record for North America.

The podetia of f. *monstrosa* are somewhat like those of the preceding form but are variously curved and swollen and may be sparingly branched.

\*CLADONIA BACILLARIS f. SUBTOMENTOSULA Sandst. Abhandl. Naturw. Ver. Bremen **25**: 129. 1922 (as modification); in Anders, Strauch- und Laubfl. Mitteleuropas 61. 1928 (as form). On earth, more rarely on logs. Killingworth (1932, det. Sandstede), Middletown (1932, det. Sandstede), Salisbury (1932, det. Sandstede), and Voluntown (1933).

The robust podetia of f. *subtomentosula* are about 2 cm. high and gradually broaden out in the upper part, where they may attain a diameter of 2 mm. They are either simple and rounded at the apex or broken up into a few short and rounded branches. The whole apical surface is densely farinose-sorediose, and the soredia vary in color from whitish gray to pale greenish. The apothecia, if present at all, are minute and immersed, but many of the podetia are completely sterile. The form bears a certain resemblance to f. *clavata* and f. *peritheta* (Wallr.) Arn. (p. 397) but is more densely sorediose than either.

\*CLADONIA BACILLARIS f. PITYROPODA Nyl. in Crombie, Grevillea

11: 115. 1883 (*nomen nudum*); Crombie, Monogr. Lich. Britain 1: 172. 1894. On rich soil in spruce woods, Salisbury (1932, det. Sandstede). New to North America.

This interesting form is characterized by the presence of squamules on the podetia. They are found, not only in the basal portion, where their occurrence would not be unusual, but also in the apical portion. In the latter position they are frequently interspersed among the apothecia. Typical podetia of f. *pityropoda* are more or less curved, and additional squamules may be developed on the convex side of the curvature. A narrow squamulose band is thus formed, connecting in some cases the squamulose region at the base with the squamulose region at the apex. The presence of squamules indicates the presence of cortex and at once raises the question whether f. *pityropoda* should be included under *C. bacillaris* or *C. Floerkeana*. In separating these two species Vainio laid emphasis on differences in the distribution of the cortex. According to his account<sup>1</sup> the podetial cortex in *C. bacillaris* is almost entirely restricted to the basal region, and any squamules that may be present are similarly restricted. In *C. Floerkeana*, on the other hand, the cortex is better developed and is found throughout the entire length of the podetium, either as a continuous layer or in the form of more or less clearly defined patches; and squamules, if present at all, show a similar distribution. On the basis of this distinction f. *pityropoda* should be referred to *C. Floerkeana*, and Vainio<sup>2</sup> included it among the synonyms of *C. Floerkeana* var. *carcata*. Harmand,<sup>3</sup> however, in separating *C. Floerkeana* from *C. bacillaris*, emphasized differences in the size of the soredia. If these are large enough to be called granular, *C. Floerkeana* is indicated; if small enough to be called farinose, the plants should be referred to *C. bacillaris*. Sandstede<sup>4</sup> employs a similar distinction in his key, when he separates *C. Floerkeana* var. *intermedia*, with granular soredia, from *C. bacillaris*, with farinose soredia. Apparently because the soredia of f. *pityropoda* are farinose, rather than granular, he includes the form under *C. bacillaris*.<sup>5</sup>

\*CLADONIA BACILLARIS f. TENUISTIPITATA Sandst. Abhandl. Naturw. Ver. Bremen 25: 130. 1922 (as modification); in Rabenhorst, Kryptogamen-Flora 9, Abt. 4<sup>2</sup>: 106. pl. 6, f. 8. 1931 (as form). On earth in a field, Voluntown (1933, det. Sandstede). New to North America.

<sup>1</sup> Acta Soc. F. et Fl. Fennica 4: 74, 90. 1887.

<sup>2</sup> Ibid. 10: 441. 1894.

<sup>3</sup> Lich. France 3: 337. 1907.

<sup>4</sup> In Rabenhorst, Kryptogamen-Flora 9, Abt. 4<sup>2</sup>: 19. 1931.

<sup>5</sup> Op. cit. 105; also Abhandl. Naturw. Ver. Bremen 18: 400. 1906; 25: 129. 1922.

The podetia of *f. tenuistipitata* are long and slender and are either simple or sparingly branched, with slender ascending or suberect branches. The diameter, although variable, rarely exceeds 0.5 mm. According to Sandstede the form is often associated with *C. macilenta*.

CLADONIA BACILLARIS *f. SOREDIATA* Sandst. (Notes, p. 125). Canton (1933) and Hamden (*Mrs. Black & Mrs. Hobbs*, 1933).

CLADONIA BACILLARIS *f. ABBREVIATA* (Vainio) Harm. (Notes, p. 124). Killingworth (1932), Meriden (1933), Middlefield (1932), Middletown (1932), and North Haven (1931, not previously reported). With a single exception these records are based on determinations made by Sandstede.

CLADONIA MACILENTA *f. STYRACELLA* (Ach.) Vainio (p. 399; Notes, p. 125). Barkhamsted (1933), Bristol (1933), Canton (1933), East Hampton (1932), Franklin (1932), Harwinton (1933), Killingworth (1932), Lebanon (1933), Monroe (1933), Salisbury (1932), and Windsor (1933).

CLADONIA MACILENTA Hoffm. *f. GRANULOSA* Aigr. (p. 400; Notes, p. 125). Durham (1932) and Salisbury (1932).

#### Subsection STRAMINEO-FLAVIDAE

CLADONIA PLEUROTA (Floerke) Schaer. (p. 400; Notes, p. 125). Avon (1933), Burlington (1933), Canton (1933), Cheshire (1932), Colchester (1932), East Haddam (1933), Franklin (1932), Griswold (1933), Guilford (1932), Hebron (1933), Killingworth (1932), Middletown (1932), Milford (1932), Newington (*Clark*, 1933), Pomfret (*Mrs. Paine*, 1933), Voluntown (1933), Wethersfield (*Clark*, 1933), Windsor (1933), and Wolcott (1933).

CLADONIA PLEUROTA *f. DECORATA* Vainio (p. 402; Notes, p. 127). East Haddam (1933), Hamden (*Mrs. Black & Mrs. Hobbs*, 1933), and Windsor (1933).

CLADONIA PLEUROTA *var. FRONDESCENS* (Nyl.) Oliv. (p. 403; Notes, p. 128). Colchester (1932), Hamden (*Mrs. Black & Mrs. Hobbs*), and Middletown (1932).

CLADONIA PLEUROTA *f. CERINA* (Nagel) Oliv. (Notes, p. 128). Barkhamsted (1933, with apothecia) and East Haddam (1933, with spermagonia). The apothecial condition of this form has not previously been reported from Connecticut.

CLADONIA PLEUROTA *f. ALBIDA* Vainio (Notes, p. 128). Bristol (1933), Burlington (1933, det. Sandstede), Canton (1933, det. Sandstede), Harwinton (1933), and Monroe (1933, det. Sandstede).

CLADONIA CRISTATELLA Tuck. (p. 403; Notes, p. 128). Portland (1933), Willington (1933), and Windsor (1933).

CLADONIA CRISTATELLA *f. BEAUVOISII* (Del.) Vainio (p. 405; Notes, p. 128). Ashford (*Clark*, 1933), Barkhamsted (1933), Burlington (1933), Canterbury (1933), Canton (1933), East Haddam (*Clark*, 1933), Franklin (1932), Griswold (1933), Hamden (*Eaton*, 1866, not

previously reported, first record for town), Harwinton (1933), Lebanon (1932), Marlboro (1933), Newington (*Clark*, 1933), Simsbury (1933), Stafford (1932), Thomaston (1933), Voluntown (*Nichols*, 1933), Watertown (1933), Wethersfield (*Clark*, 1933), Willington (1932), and Wolcott (1933).

CLADONIA CRISTATELLA f. VESTITA Tuck. (p. 407; Notes, p. 129). Ashford (*Clark*, 1933), Burlington (1933), Canterbury (1933), Canton (1933), Columbia (1933), East Haddam (*Clark*, 1932; Evans, 1933), Griswold (1933), Harwinton (1933), Killingworth (1932), Lebanon (1932), Marlboro (1933), Middletown (1932), Monroe (1933), Newington (*Clark*, 1933), Portland (1933), Simsbury (1933), Suffield (*Smith*, 1933), Thomaston (1933), Watertown (1933), Wethersfield (*Clark*, 1933), Willington (1932), and Wolcott (1933).

CLADONIA CRISTATELLA f. SQUAMOSISSIMA Robbins (p. 408; Notes, p. 129). Durham (1932) and East Haddam (1933).

CLADONIA CRISTATELLA f. PLEUROCARPA Robbins (p. 408; Notes, p. 129). Barkhamsted (1933), East Haddam (1933), Hamden (*Mrs. Black & Mrs. Hobbs*, 1933), Lebanon (1932), Stafford (1932), and Watertown (1933).

CLADONIA CRISTATELLA f. **scyphulifera** Sandst. f. nova, podetia apice verticillatim ramosa, ramis apothecis terminatis, plus minusve unitis et scyphos irregulares formantibus, cavitatis haud profundis.

On earth and old wood. Canton (1933), Killingworth (1933), Lebanon (1932), Meriden (1933), and Windsor (1933). Most of these determinations have been made or verified by Sandstede.

The writer (p. 404) has already called attention to the fact that the podetia of *C. cristatella*, in some cases, are terminated by shallow cup-like expansions formed by whorls of branches. Dr. Sandstede now suggests that plants bearing podetia of this character be distinguished as f. *scyphulifera*. Under the most typical condition the branches are subequal in length and coalescent throughout the greater part of their extent, so that the apothecia appear sessile or short-stipitate on the margins of the expansions. In most cases, however, the branches are unequal in length and irregularly coalescent, so that the expansions become less cup-like. The podetial surface is smooth or sparingly squamulose.

CLADONIA CRISTATELLA f. **aurantiaca** Robbins, f. nova, apothecia aurantiaca.

On earth and old wood. Voluntown (*Nichols*, 1933) and Windsor (1933, first record for Connecticut).

The orange-colored apothecia of f. *aurantiaca* are intermediate in color between the vivid scarlet apothecia of the typical forms of the species and the pale apothecia of f. *ochrocarpia* and f. *squamulosa*. The form was named in manuscript by Mr. Robbins.

CLADONIA CRISTATELLA f. OCHROCARPIA Tuck. (p. 409). Canton (1933), Madison (1933), Watertown (1933), and Windsor (1933).

CLADONIA CRISTATELLA f. SQUAMULOSA Robbins (p. 410; Notes, p. 129). Ashford (*Clark*, 1933) and Marlboro (1933).

CLADONIA INCRASSATA Floerke (Notes, p. 129). Branford (1932), Franklin (1932), Griswold (1933), Meriden (1933), Middletown (1932), Portland (1933), Salisbury (1932), Voluntown (1933), and Willington (1932).

CLADONIA INCRASSATA f. SQUAMULOSA (Robbins) Evans (Notes, p. 129). Branford (1932) and Griswold (1933).

### Section OCHROPHAEAE

#### Subsection UNCIALES

CLADONIA UNCIALIS (L.) Web. (p. 413; Notes, p. 131). Berlin (*Clark*, 1932), Cheshire (1932), Griswold (1933), Hartford (*Clark*, 1933), Hartland (1933), Madison (1933), Marlboro (1933), Monroe (1933), Portland (1933), and Thomaston (1933).

CLADONIA UNCIALIS f. DICRAEA (Ach.) Vainio (p. 416; Notes, p. 133). Pomfret (*Mrs. Paine*, 1933, det. Sandstede).

CLADONIA UNCIALIS f. OBTUSATA (Ach.) Nyl. (p. 415). Killingworth (*Hall*, 1874, det. Sandstede, not previously reported).

CLADONIA UNCIALIS f. SETIGERA Anders (Notes, p. 134). Bristol (1933), Canton (1933), Guilford (1932), Killingworth (1932), Middletown (1932), Salisbury (1932, det. Sandstede), and Simsbury (1933).

CLADONIA UNCIALIS f. SPINOSA Oliv. (p. 417; Notes, p. 133). Guilford (1932), Hartford (*Clark*, 1933), and Middletown (1932).

\*CLADONIA UNCIALIS f. SORALIGERA Robbins, RHODORA 26: 147. 1924 (as modification); Sandstede, in Rabenhorst, Kryptogamen-Flora 9, Abt. 4<sup>2</sup>: 190. 1931 (as form). On earth over rocks. Canton (1933), Guilford (1932, first authentic record for Connecticut), Killingworth (1932), and Middletown (1932).

As shown on p. 414 of the writer's report the record for f. *soraligera* in the "Catalogue of the Lichens of Connecticut," p. 23, was based on an incorrect determination. The form was originally described from specimens collected by Robbins at Wareham, Massachusetts, and distributed by Sandstede in his Cladoniae Exsiccatae, No. 1217.

The soredia of f. *soraligera*, which is a homologue of *C. mitis* f. *soralifera*, form irregular yellowish masses, 1-12 mm. in diameter, on the surface of the podetia. In the material from Connecticut the plants are prostrate and poorly developed, but Robbins states that the sorediate condition may sometimes be associated with erect plants.

CLADONIA CAROLINIANA (Schwein.) Tuck. f. DILATATA Evans (Notes, p. 138). Berlin (*Clark*, 1932), Canterbury (1933), East Haddam

(1933), Griswold (1933), Guilford (*Miss Fulford*, 1932; *Evans*, 1932), Middletown (1932), North Haven (*Miss Fulford*, 1932), Simsbury (1933), Thomaston (1933), and Woodbridge (*Eaton*, 1875, not previously reported).

CLADONIA CAROLINIANA f. FIBRILLOSA Evans (Notes, p. 139). Griswold (1933), Killingworth (*Hall*, 1875, mixed with f. *dilatata*; see Notes, p. 138), and Woodbridge (*Eaton*, 1875, not previously reported).

CLADONIA CAROLINIANA f. TENUIRAMEA Evans (Notes, p. 139). Bristol (1933), East Haddam (1933), East Hampton (1932), Griswold (1933), Middletown (1932), Simsbury (1933), and Thomaston (1933).

CLADONIA CAROLINIANA f. PROLIFERA Evans (Notes, p. 139). Bethany (*Miss Fulford*, 1932), Guilford (1932), Killingworth (1932), Middlefield (1932), Middletown (1932), and Thomaston (1933).

CLADONIA BORYI Tuck. f. RETICULATA (Russell) Merrill (Notes, p. 141). Griswold (1933), Killingworth (1932), Middletown (1933), and Simsbury (1933).

CLADONIA BORYI f. LACUNOSA (Bory) Tuck. (p. 418; Notes, p. 141). Killingworth (1932) and Simsbury (1933).

CLADONIA BORYI f. PROLIFERA Robbins (p. 419). East Haddam (*Clark*, 1932).

#### Subsection CHOSMARIAE

##### Group MICROPHYLLAE

CLADONIA FURCATA (Huds.) Schrad. (p. 420; Notes, p. 153). Killingworth (1932), Monroe (1933), and Wethersfield (*Clark*, 1933). These records are based on specimens which are indefinite as to form.

CLADONIA FURCATA var. RACEMOSA (Hoffm.) Floerke (p. 422; Notes, p. 153). Canton (1933), Coventry (*Clark*, 1933), East Haddam (1933), Hartland (1933), Hebron (1933), Killingworth (*Hall*, 1874, det. Sandstede, not previously reported), Litchfield (1933), Marlboro (1933), Meriden (1933), Pomfret (*Mrs. Paine*, 1933), Portland (1933), and Voluntown (1933, det. Sandstede).

CLADONIA FURCATA var. RACEMOSA f. FURCATOSUBULATA (Hoffm.) Vainio (p. 422; Notes, p. 153). Branford (1932, det. Sandstede), Canton (1933, det. Sandstede), Durham (1932), East Haddam (1933), Griswold (1933), Killingworth (1933, det. Sandstede), Lebanon (1932), and Voluntown (1933, det. Sandstede).

CLADONIA FURCATA var. RACEMOSA f. CORYMBOSA (Ach.) Vainio (p. 433; Notes, p. 153). Litchfield (1933).

CLADONIA FURCATA var. RACEMOSA f. FISSA (Floerke) Aigret (Notes, p. 153). Killingworth (1932; 1933, det. Sandstede) and Portland (1933).

\*CLADONIA FURCATA var. RACEMOSA f. ARBUSCULA (Floerke) Anders, *Strauch- und Laubfl. Mitteleuropas* 73. pl. 8, f. 8. 1928 (as modification); Sandstede in Rabenhorst, *Kryptogamen-Flora* 9, Abt. 4<sup>2</sup>: 198. 1931 (as form). *C. furcata*  $\delta$  *fissa* subvar. *arbuscula* Floerke, *Clad. Comm.* 152. 1828. *C. furcata* var. *corymbosa* f. *arbuscula* Zahlbr.

Cat. Lich. Univ. **4**: 527. 1927. On earth in open woods, Branford (1932, det. Sandstede).

The podetia of f. *arbuscula* are fertile, as in f. *corymbosa*, but the branches bearing the apothecia form loose spreading clusters; in f. *corymbosa* the clusters are more compact.

CLADONIA FURCATA var. RACEMOSA f. SUBCLAUSA Sandst. (p. 423). Canterbury (1933), East Haddam (1933), and Essex (1931, not previously reported). The determinations were made or verified by Sandstede.

CLADONIA FURCATA var. RACEMOSA f. SQUAMULIFERA Sandst. (Notes, p. 153). Canton (1933), Durham (1932, det. Sandstede), East Haddam (1933), Goshen (*Miss Sudbury*, 1927, not previously reported), Killingworth (1932), Litchfield (1933), Madison (1931, listed in Notes as from Killingworth; *Clark*, 1932), Marlboro (1933), New Haven (*Nichols*, 1909, listed in Report, p. 424, as var. *pinnata*), Salisbury (1932, det. Sandstede), and Stafford (1932, det. Sandstede).

CLADONIA FURCATA var. PALAMAEA (Ach.) Vainio (p. 425; Notes, p. 154). Branford (1932), Durham (1932), Killingworth (1932, det. Sandstede), Lebanon (1933), and Middlefield (1932, det. Sandstede).

\*CLADONIA FURCATA var. PALAMAEA f. IMPLEXA (Floerke) Aigret, Bull. Soc. Roy. Bot. Belgique **40**: 114. 1901 (as *C. furcata*  $\delta$ . *palamaea* dd. *implexa*); Zahlbruckner, Cat. Lich. Univ. **4**: 528. 1927 (as form). *C. furcata* f. *implexa* Floerke, Clad. Comm. 146. 1828. On earth in field, Hebron (1933, det. Sandstede).

The plants in f. *implexa* form prostrate dark brown colonies. The podetia grow in all directions and are intricately branched and interwoven.

CLADONIA FURCATA var. PALAMAEA f. SUBULATA (Ach.) Vainio (p. 425). Guilford (1932, det. Sandstede).

\*CLADONIA FURCATA var. PALAMAEA f. RIGIDULA (Mass.) Oliv. Mém. Soc. Sci. Nat. Math. Cherbourg **36**: 128. 1907. On rocks, Guilford (1932).

In the writer's report, p. 426, the present form is recorded as a variety of *C. furcata*, following the example of Vainio. Both Sandstede and Anders, however, now agree with Olivier in regarding it as a form of var. *palamaea*. The presence of squamules on the podetia make it a homologue of var. *racemosa* f. *squamulifera*.

CLADONIA FURCATA var. PINNATA (Floerke) Vainio (p. 424). Canton (1933) and New Haven (*Hall*, 1874, det. Sandstede, not previously reported).

CLADONIA FURCATA var. PINNATA f. FOLIOLOSA (Del.) Vainio (p. 424; Notes, p. 154). Portland (1933).

\*CLADONIA FURCATA var. PINNATA f. *recurva* (Hoffm.) Zahlbr. Cat. Lich. Univ. **4**: 531. 1927. *C. furcata* *C. recurva* Hoffm. Deutschl.

Fl. 2: 115. 1796. New Haven (*Hall*, 1874, det. Sandstede, not previously reported).

Some of the podetial branches in *f. recurva* are attenuate and more or less strongly curved, thus giving the plants a peculiar appearance. Specimens from Fayette, Iowa, collected by Fink in 1894, have been distributed in Sandstede's *Cladoniae Exsiccatae*, No. 664.

\**CLADONIA FURCATA* var. *PINNATA* f. *TURGIDA* (Scriba) Sandstede in *Rabenhorst, Kryptogamen-Flora* 9, Abt. 4<sup>2</sup>: 211. 1931. *C. furcata* f. *turgida* Scriba in Sandstede, *Clad. Exsic. 1000*. 1923. Among mosses in a *Chamaecyparis* bog, Killingworth (1933). New to North America.

The podetia of *f. turgida*, which has a wide distribution in Europe, are irregularly branched and swollen. The ultimate branches, in many cases, are more or less incurved and may be pointed and sterile or tipped with apothecia. The podetial squamules vary greatly in abundance and may be almost lacking.

*CLADONIA SCABRIUSCULA* (Del.) Leight. f. *FARINACEA* (Vainio) Sandstede (p. 427; Notes, p. 154). Canton (1933), Durham (1932), Killingworth (1933), Lebanon (1932, 1933), Litchfield (1933), Meriden (1933), Portland (1933), Voluntown (1933), and West Hartford (*Clark*, 1932).

*CLADONIA MULTIFORMIS* Merrill f. *FINKII* (Vainio) Evans (p. 429; Notes, p. 154). Canton (1933) and Hartland (1933).

*CLADONIA MULTIFORMIS* f. *SIMULATA* Robbins (p. 429). Canton (1933).

*CLADONIA MULTIFORMIS* f. *SUBASCYPHA* (Vainio) Evans (p. 430). Killingworth (1933).

*CLADONIA MULTIFORMIS* f. *SUBTESTACEA* (Vainio) Evans (p. 430). Canton (1933).

*CLADONIA SQUAMOSA* (Scop.) Hoffm. (p. 432; Notes, p. 154). Canton (1933), Guilford (1932), Hartland (1933), Hebron (1933), Killingworth (1933), Portland (1933), Stafford (1932), and Voluntown (1933). The specimens upon which these records are based are not referable to definite forms.

*CLADONIA SQUAMOSA* f. *DENTICOLLIS* (Hoffm.) Floerke (p. 434; Notes, p. 154). Ashford (*Clark*, 1933), Canton (1933, det. Sandstede), Harwinton (1933, det. Sandstede), Harwinton (1933, det. Sandstede), Madison (1931, listed in Notes as from Killingworth), and Salisbury (1932, det. Sandstede).

*CLADONIA SQUAMOSA* f. *SQUAMOSISSIMA* Floerke (p. 434). Salisbury (1932).

*CLADONIA SQUAMOSA* f. *MURINA* Scriba (p. 437). Hamden (*Mrs. Black & Mrs. Hobbs*, 1933, det. Sandstede), Killingworth (1933, det. Sandstede), Middletown (1932), and Salisbury (1932, det. Sandstede).

\**CLADONIA SQUAMOSA* f. *CALLOSA* (Del.) Anders, Strauch- und

Laubfl. Mitteleuropas 81. 1928 (as var. *denticollis* f. *callosa*). *Cenomyce callosa* Del. Ms. *Cladonia pyxidata* 2) *callosa* Nyl. in Ohlert,-Schr. Königl. Physikal.-Ökonom. Ges. Königsberg 11: 5. 1871. *C. callosa* Harm. Lich. France 3: 326. 1907. On rocks. Guilford (1932, first collection for the State) and Middlefield (1932), both determined by Sandstede. New to North America.

The plants of f. *callosa* form compact cushions, approximately hemispherical in shape, on the surface of rocks. The densely crowded squamules are narrow and 3-10 mm. in length, and most of the colonies are sterile throughout. Some of the earlier writers associated f. *callosa* with *C. pyxidata*, but Sandstede<sup>1</sup> showed that it lacked the bitter taste characteristic of *C. pyxidata* and its allies. Comparison of the plant with depauperate forms of the mild-tasting *C. squamosa* convinced him that f. *callosa* should be included under that species, and it was soon definitely placed there by Anders, as indicated in the synonymy.

CLADONIA SQUAMOSA f. PHYLLOCOMA (Rabenh.) Vainio (p. 434; Notes, p. 154). Hamden (*Mrs. Black & Mrs. Hobbs*, 1933) and Stafford (1932), both determined by Sandstede.

\*CLADONIA SQUAMOSA f. CLAVARIELLA Vainio, Acta Soc. F. et Fl. Fennica 4: 443. 1887; Zahlbruckner, Cat. Lich. Univ. 4: 595. 1927 (as variety). On banks, rocks, and logs. Canton (1933), Hartland (1933), Litchfield (1933), and Voluntown (1933). The determinations were made by Sandstede. Not before reported from North America.

The podetia, as brought out by Vainio's original description and by the later description of Sandstede,<sup>2</sup> are cupless, irregularly branched, 7-25 mm. in height, 0.7-2 mm. in diameter, and blunt at their apices. Throughout the greater part of their length they are densely covered with small squamules, among which a few larger squamules may be interspersed. Toward the tips of the podetia the surface is more or less decorticate and presents a somewhat granulose appearance. In many cases the more typical podetia of f. *clavariella* are associated with plants in which the distinctive peculiarities of the form are only partially realized.

\*CLADONIA SQUAMOSA f. PHYLLOPODA Vainio, Acta Soc. F. et Fl. Fennica 4: 441. 1887. *C. squamosa* var. *muricella* f. *phyllopoda* Oliv. Mem. Soc. Sci. Nat. Math. Cherbourg 36: 133. 1907. On rocks. Milford (1931, det. Sandstede, not previously reported) and Wolcott (1933, det. Sandstede). New to North America.

The primary thallus in f. *phyllopoda* is persistent and well-developed, being formed (according to Vainio's account) of squamules

<sup>1</sup> Abhandl. Naturw. Ver. Bremen 25: 214. 1922.

<sup>2</sup> In Rabenhorst, Kryptogamen-Flora 9, Abt. 4<sup>2</sup>: 273. 1931.

3–5 mm. long and 2–3 mm. wide. The podetia which are only 2–8 mm. in height, are poorly developed and variable. In some cases they are subulate, in others more or less distinctly cup-forming, and the surface is either sparingly squamulose or smooth.

CLADONIA SQUAMOSA f. LEVICORTICATA m. RIGIDA (Del.) Evans (p. 435; Notes, p. 154). Middletown (1932, det. Sandstede).

\*CLADONIA CARASSENSIS Vainio, Acta Soc. F. et Fl. Fennica 4: 313. 1887. On log in Chamaecyparis swamp, Stafford (1932, det. Sandstede).

The original material of *C. carassensis* was collected "in montibus Carassae," Brazil, by Vainio in 1885. Nearly forty years later Robbins found the species at Wareham, Massachusetts, and based two new forms and a new modification on his specimens.<sup>1</sup> The discovery of the species in Connecticut represents an interesting addition to the flora of the State.

In its general appearance *C. carassensis* bears a strong resemblance to certain forms of *C. crispata* (Ach.) Flot. and *C. squamosa* but is distinguished from both by giving a distinct yellow reaction with KOH. It agrees in this respect with *C. subsquamosa* (Nyl.) Vainio, another northern species with open cups. In *C. subsquamosa*, however, the podetial surface is more or less granular, whereas in *C. carassensis* the surface is smooth throughout. Since *C. subsquamosa* has been reported from Quebec and the State of Washington, it is perhaps to be expected in Connecticut.

The specimens from Stafford are much like f. *subregularis* Vainio, one of the two Massachusetts forms described by Robbins. They agree in having podetia 20–40 mm. high, with moderately dilated cups and a surface free or nearly so from squamules. The color of the podetia, however, instead of being a mixture of glaucescent and olivaceous shades, as in f. *subregularis*, is uniformly grayish except at the tips of the branches. For this reason the Stafford specimens are referred simply to the species.

CLADONIA CENOTEA (Ach.) Schaer. f. EXALTATA Nyl. (Notes, p. 155). Willington (*Clark*, May 30, 1932; *Evans*, June 4, 1932), the second station for the State.

CLADONIA DELICATA (Ehrh.) Floerke f. QUERCINA (Pers.) Vainio (p. 439; Notes, p. 156). Durham (1932), Killingworth (1932), and Voluntown (1933).

CLADONIA CAESPITICIA (Pers.) Floerke (p. 439; Notes, p. 156). Bristol (1933), Burlington (1933), Canton (1933), East Haddam (1933), Guilford (*Clark*, 1933), Harwinton (1933), Killingworth

<sup>1</sup> RHODORA 26: 146, 147. 1924.

(1932), Southington (1932), Voluntown (1933), and Watertown (1933).

#### Group MEGAPHYLLAE

CLADONIA APODOCARPA Robbins (p. 440; Notes, p. 156). Canton (1933), Cheshire (1932), Colchester (1933), Durham (1932), Guilford (*Miss Fulford*, 1932; *Evans*, 1932), Harwinton (1933), Killingworth (1932), Marlboro (1933), Middlefield (1932), Middletown (1932), Newington (*Clark*, 1933), and Suffield (*Smith*, 1933).

CLADONIA TURGIDA (Ehrh.) Hoffm. (p. 441). Salisbury (1932).

CLADONIA TURGIDA f. SCYPHIFERA Vainio (p. 442). Hartland (1933).

CLADONIA TURGIDA f. CORNICULATA Floerke (p. 442). Salisbury (1932).

#### Subsection CLAUSAE

#### Group PODOSTELIDES

#### Subgroup HELOPODIUM

CLADONIA MITRULA Tuck. f. IMBRICATULA (Nyl.) Vainio (p. 444; Notes, p. 156). Burlington (1933), Canton (1933), Columbia (1933), Killingworth (1932), Meriden (1933), Portland (1933), Suffield (*Smith*, 1933), Thomaston (1933), Voluntown (1933), Watertown (1933), and Wethersfield (*Clark*, 1933).

CLADONIA CLAVULIFERA Vainio f. NUDICAULIS Evans (p. 447; Notes, p. 156). Burlington (1933), Canterbury (1933), Killingworth (1933), Madison (1933), and Voluntown (1933).

CLADONIA CLAVULIFERA f. SUBVESTITA Robbins (p. 447; Notes, p. 156). Guilford (1932, det. Sandstede), Killingworth (1933), and Madison (1933).

CLADONIA SUBCARIOSA Nyl. (p. 449). Hamden (*Mrs. Hobbs & Mrs. Black*, 1933) and Suffield (*Smith*, 1933), both specimens without podetia.

CLADONIA SUBCARIOSA f. EVOLUTA Vainio (p. 450; Notes, p. 156), Avon (1933), Canton (1933), Durham (1932), Franklin (1932), Hebron (1933), Killingworth (1933), Lebanon (1932), Middlefield (1932), Pomfret (*Mrs. Paine*, 1933), Portland (1933). Simsbury (1933), Wethersfield (*Clark*, 1933), and Wolcott (1933).

CLADONIA SUBCARIOSA f. PLEUROCARPA Robbins (p. 451). Durham (1932).

CLADONIA SUBCARIOSA f. SQUAMULOSA Robbins (p. 451; Notes, p. 156). Durham (1932) and Guilford (1932).

CLADONIA BREVIS Sandst. (Notes, p. 156). Avon (1933), Burlington (1933), and Madison (1933).

#### Subgroup MACROPUS

CLADONIA ALPICOLA (Flot.) Vainio (p. 452). The var. *karelica* Vainio of this species was listed on p. 452, on the basis of two speci-

mens. It was shown in the Notes, however, that one of these specimens represented *C. strepsilis* f. *glabrata*, whereas the other represented *C. brevis*. It was further shown that several other North American specimens, which had been determined as var. *karelica*, were likewise referable to *C. brevis*. It is now possible to record from Connecticut another Cladonia which authors include under *C. alpicola*, although it is not altogether certain that it belongs there. The Cladonia in question is the following:

\*CLADONIA ALPICOLA f. MINOR (Vainio) Kovář, Věstník Klubu přírod. Prostějově **15**: 154. 1912. *Cladonia alpicola* α. *foliosa* f. *minor* Vainio, Acta Soc. F. et Fl. Fennica **10**: 64. 1894. On earth. Griswold (1933, ver. Sandstede) and Killingworth (*Hall*, 1874, det. Sandstede, listed on p. 449 as *C. cariosa* f. *squamulosa*).

Although Vainio considered the present plant an inconstant form of var. *foliosa* (Sommerf.) Vainio, the Connecticut specimens differ from the usual forms of this variety in several respects. The podetia, for example, instead of being 1–6 cm. in height, are only 3–6 mm. in height; and the podetial surface, instead of being squamulose, is nearly or entirely free from squamules. The podetia, in the majority of cases, are cylindrical, unbranched, and tipped with dark brown apothecia, which are more or less peltate. The cortex shows definite areolae, which are either close together or somewhat separated from one another, thus exposing the translucent medulla.

Since the podetia of f. *minor* are apparently destitute of spermatogonia, there is a possibility that the plant should be associated with members of the subgroup Helopodium. There are, in fact, two species of this group which f. *minor* resembles morphologically and with which it further agrees in being negative with KOH. These species are *C. clavulifera* and *C. brevis*. In *C. clavulifera*, however, the podetial cortex is continuous or subcontinuous throughout, and in *C. brevis*, which is a slightly larger plant, the podetia increase in diameter upward. Unfortunately the position of the spermatogonia in f. *minor* has not yet been satisfactorily demonstrated, so that its place in the system must remain in doubt.

#### Group THALLOSTELIDES

CLADONIA GRACILIS (L.) Willd. var. DILATATA (Hoffm.) Vainio (p. 457). Canton (1933).

CLADONIA VERTICILLATA (Hoffm.) Schaer. (p. 458). Hamden (*Eaton*, 1866, not previously reported) and Windsor (1933); both specimens are young.

CLADONIA VERTICILLATA f. EVOLUTA (Th. Fr.) Stein (p. 459; Notes, p. 159). Burlington (1933), Canton (1933), Durham (1932), Griswold (1933), Harwinton (1933), Lebanon (1932), Meriden (1933), Pomfret (*Mrs. Paine*, 1933), Simsbury (1933), and West Hartford (*Clark*, 1932).

\*CLADONIA VERTICILLATA f. AGGREGATA (Del.) Oliv. Fl. Lich. de l'Orne 52. 1882. *C. cervicornis* var. *verticillata* f. *aggregata* (Del.) Malbr. Suppl. Lich. Normandie 11. 1881. *C. verticillata* var. *evoluta* f. *aggregata* Zahlbr. Cat. Lich. Univ. 4: 626. 1927. On shaded earth. Durham (1932) and Watertown (1933).

The proliferations from the upper surface of the cups, instead of being single, as in f. *evoluta*, are numerous and closely packed together.

CLADONIA VERTICILLATA f. APOTICTA (Ach.) Vainio (p. 460; Notes, p. 159). Burlington (1933) and Harwinton (1933).

CLADONIA VERTICILLATA f. PHYLLOCEPHALA (Flot.) Oliv. (p. 461). Canton (1933).

CLADONIA MATEOCYATHA Robbins (p. 461). Monroe (1933) and Pomfret (*Mrs. Paine*, 1933); the specimens show the thallus only.

CLADONIA MATEOCYATHA f. LEIOSCYPHA Evans (p. 462; Notes, p. 159). Avon (1933), Griswold (1933), and Meriden (1933).

CLADONIA MATEOCYATHA f. SQUAMULATA Robbins (p. 462; Notes, p. 159). Avon (1933), Meriden (1933), Monroe (1933), and Windsor (1933).

CLADONIA PYXIDATA (L.) Hoffm. var. NEGLECTA (Floerke) Mass. f. SIMPLEX (Ach.) Harm. (p. 464; Notes, p. 159). Bristol (1933), Durham (1932, det. Sandstede), East Haddam (1933), Hamden (*Mrs. Hobbs & Mrs. Black*, 1933), Harwinton (1933), Hebron (1933), Killingworth (*Hall*, 1875, det. Sandstede, not previously reported), Madison (1933), Marlboro (1933), Meriden (1933), New Haven (*Nichols*, 1909, not previously reported), Simsbury (1933), and Stafford (1932, det. Sandstede). The three specimens determined by Sandstede were referred simply to var. *neglecta*. The records for Killingworth and New Haven antedate those given on p. 464.

CLADONIA PYXIDATA var. NEGLECTA f. LOPHYRA (Ach.) Koerb. Hamden (*Mrs. Hobbs & Mrs. Black*, 1933).

\*CLADONIA PYXIDATA var. POCILLUM (Ach.) Flot. f. CAESIOCINEREA Bouly de Lesdain, Bull. Soc. Bot. France 68: 16. 1921. On rocks, Milford (1927, det. Sandstede, not previously reported). New to North America. The Milford specimens of var. POCILLUM, listed on p. 159 of the Notes, approach f. *caesiocinerea*.

According to the description of Sandstede<sup>1</sup> the primary squamules of f. *caesiocinerea*, which are characterized by their ashy to bluish color, unite to form rosettes with a diameter of about 4 cm. In the middle of the rosette they are relatively small and imbricated; to-

<sup>1</sup> In Rabenhorst, Kryptogamen-Flora 9, Abt. 4<sup>2</sup>: 408. 1931.

ward the periphery they are larger and appressed to the substratum. The podetia are sparingly produced.

\*CLADONIA MAGYARICA Vainio var. POCILLIFORMIS Vainio in Anders, Arch. Protistenk. **71**: 501. *pl.* 21, *f.* 1. 1930. On earth. East Haddam (Clark, 1932, det. Sandstede). New to the United States.

The species, as well as the var. *pocilliformis*, was based on Hungarian material. Sandstede,<sup>1</sup> however, records the variety, not only from Hungary, but also from Sweden, Switzerland, Algeria, Istria, Macedonia, and the West Indian republic of Haiti.

This interesting species is a close relative of *C. pyxidata* but is distinguished by giving a distinct yellow reaction with KOH. Sandstede notes that var. *pocilliformis* agrees with *C. pyxidata* var. *pocillum* in forming definite rosette-like clusters. The squamules in the middle of these clusters are appressed and brownish, whereas those at the periphery are ascending and grayish green. The podetia, which lack soredia, are more slender than those of var. *pocillum*, and the cups are less expanded.

CLADONIA CHLOROPHAEA (Floerke) Spreng. (p. 465; Notes, p. 139). Avon (1933), Barkhamsted (1933), Bridgewater (1928), Burlington (1933), Canterbury (1933), Canton (1933), Cheshire (1932), Colchester (1932), East Haddam (1933), Goshen (1927, not previously reported), Hamden (Mrs. Black & Mrs. Hobbs, 1933), Hartland (1933), Killingworth (1932, 1933), Lebanon (1932), Litchfield (1933), Madison (1932), Middlefield (1932), Portland (1933), Shelton (1928, listed in Report as f. *simplex*), Voluntown (1933), West Hartford (Clark, 1932), and Wolcott (1933). The determinations upon which these records are based were made or verified by Sandstede.

CLADONIA CHLOROPHAEA f. COSTATA (Floerke) Arn. (p. 469). Hamden (Mrs. Hobbs, 1932, det. Sandstede).

\*CLADONIA CHLOROPHAEA f. PSEUDOTRACHYNA (Harm.) Sandst. Abhandl Naturw. Ver. Bremen **25**: 221. 1922. *C. pyxidata* var. *chlorophaea* f. *pseudotrachyna* Harm. Lich. France **3**: 305. 1907. On earth in woods, Burlington (1933, det. Sandstede). Not previously reported from North America.

The podetia of f. *pseudotrachyna* are once or twice proliferous, but the ultimate proliferations are not distinctly scyphiferous. They are rather in the form of cylindrical or flattened outgrowths, in most cases tipped with apothecia. The podetial surface is granular or verruculose, except in the sorediose areas, which become decorticate and whitish. The podetia are further distinguished by being more or less furrowed or lacerate. Sandstede gives an excellent figure

<sup>1</sup> In Rabenhorst, Kryptogamen-Flora **9**, Abt. 4<sup>2</sup>: 411. 1931.

of f. *pseudotrachyna*,<sup>1</sup> which he compares with f. *costata*, a more delicate and slender plant. The figure shows podetial squamules in some abundance, and these are present also in the North American specimens.

CLADONIA CHLOROPHAEA f. PTERYGOTA (Floerke) Vainio (p. 470). Hamden (*Mrs. Black*, 1933) and Shelton (1928, previously reported simply as *C. chlorophaea*). The determinations were made by Sandstede.

\*CLADONIA CHLOROPHAEA f. INTERMEDIA Sandst. in Rabenhorst, Kryptogamen-Flora 9, Abt. 4<sup>2</sup>: 422. pl. 29, f. 8. 1931. On earth. Canton (1933) and Guilford (1928, listed on p. 468 as *C. chlorophaea* f. *simplex*). The determinations were made by Sandstede. Not previously reported from North America.

Under the above name Sandstede distinguishes a form of *C. chlorophaea* in which the cups are typically simple and more or less toothed along the margin. The teeth in some cases are tipped with spermatogonia but many of the podetia are completely sterile. The podetial cortex, which is persistent to above the middle, is smooth at the very base but forms crowded or scattered verruculae throughout the greater part of its extent. Toward the margins of the cups the surface is sorediose and soon becomes decorticate and whitish.

CLADONIA CHLOROPHAEA f. LEPIDOPHORA (Floerke) Sandst. (p. 471). Colchester (1932) and Hamden (*Mrs. Hobbs*, 1933), both determined by Sandstede.

CLADONIA CHLOROPHAEA var. PACHYPHYLLINA (Wallr.) Vainio (p. 472; Notes, p. 159). Durham (1932, det. Sandstede, as f. *pachyphyllina*).

CLADONIA GRAYI Merrill (Notes, p. 159). Berlin (1927), Bethany (1925, 1927), Branford (1928, 1932), Bridgewater (1928), Bristol (1933), Burlington (1933), Canterbury (1933), Canton (1933), Cheshire (1932), Cornwall (1928), Darien (1926), Durham (1928), East Haddam (*Clark*, 1932), East Hampton (1928, 1932), East Haven (*Miss Meyrowitz*, 1922), Essex (1927), Glastonbury (*Miss Sudbury*, 1927, not previously reported), Griswold (1933), Guilford (1925, listed in the Catalogue<sup>2</sup> as *C. pyxidata* intermediate between vars. *chlorophaea* and *neglecta*; 1928; 1932; *Miss Fulford*, 1932), Hamden (*Mrs. Black*, 1933), Killingworth (*Hall*, 1874, not previously reported; 1932; 1933), Litchfield (1927, 1933), Madison (1927; 1931, listed in the Notes as from Killingworth, not new to town), Meriden (*Musch & Nichols*, 1926), Middlefield (1932), Monroe (1933), Norfolk (*Nichols*, 1912), North Branford (*Musch & Evans*, 1927; *Evans*, 1927, not new to town), North Haven (1927), Plainville (*Wright*, 1883), Portland

<sup>1</sup> In Rabenhorst, Kryptogamen-Flora 9, Abt. 4<sup>2</sup>: pl. 29, f. 3. 1931.

<sup>2</sup> *Evans & Meyrowitz, Catalogue of the Lichens of Connecticut. Connecticut Geol. and Nat. Hist. Survey. Bull. 37. 1927.*

(1933), Salisbury (1932), Seymour (1928, not previously reported), Shelton (1928), Simsbury (1933), Southington (1932), Stamford (Marshall, 1928; Evans, 1928), Stratford (1933), Union (1927), Willington (1932), Windsor (1928), and Wolcott (1933). The determinations were all made by Sandstede; unless otherwise indicated, stations dated 1928 or earlier are listed in the writer's report under *C. chlorophaea* or one of its forms.

\*CLADONIA GRAYI f. CYATHIFORMIS Sandst. in Rabenhorst, Kryptogamen-Flora 9, Abt. 4<sup>2</sup>: 429. 1931. On banks. Meriden (1927, listed on p. 471 as *C. chlorophaea* f. *carpophora*) and Prospect (1928, listed on p. 469 as *C. chlorophaea* f. *simplex*), both determined by Sandstede. Not before recorded from North America.

According to Sandstede the primary squamules of f. *cyathiformis* are firmer than those of the ordinary forms of the species, and the podetia, which are for the most part sterile, are shorter and usually form broad and shallow cups.

CLADONIA CONISTA (Ach.) Robbins f. SIMPLEX Robbins (p. 473; Notes, p. 160). Burlington (1933), Canton (1933), Durham (1932), Harwinton (1933), Killingworth (1933), Lebanon (1932), Marlboro (1933), and Thomaston (1933).

Several of these specimens have been determined as *C. fimbriata* f. *conista* by Dr. Sandstede. He has kindly pointed out in a letter that this form is perhaps understood in too broad a sense, so that it includes, not only the plant originally distinguished by Acharius, but also the plant described by Harmand under the name *C. pyxidata* var. *chlorophaea* f. *conistea* Del.<sup>1</sup> Dr. Sandstede refers to the latter form, with some question, three of the specimens listed above. The writer, however, is not yet able to distinguish clearly between f. *conistea* and what Robbins called *C. conista* and therefore lists these questionable specimens, at least provisionally, under the latter species.

CLADONIA FIMBRIATA (L.) Fr. (p. 473; Notes, p. 160). Burlington (1933), Colebrook (Nichols, 1912, det. Sandstede, listed on p. 468 as *C. chlorophaea* f. *simplex*), East Haddam (1933), Guilford (Miss Fulford, 1932, det. Sandstede, thallus only), Lebanon (1933, det. Sandstede), Litchfield (1933), Madison (1933, det. Sandstede, thallus only), and Simsbury (1933, det. Sandstede).

The records for *C. fimbriata*, which are given on p. 474 of the writer's Report, were all based on specimens of *C. major* and are listed below under that species. There is doubt also about the systematic position of the specimens listed under f. *stenoscypha* Evans on p. 475. According to Sandstede's definition of *C. fimbriata* the podetia are always cup-forming. Since the podetia of f. *stenoscypha*

<sup>1</sup> Lich. France 3: 304. 1907.

may be either cup-forming or subulate, the form does not agree with this definition. In fact Sandstede, in a letter, transfers it to *C. coniocraea* and suggests its identity with *C. fimbriata* var. *apolepta* f. *stenoscypha* Stuckenberg,<sup>1</sup> which was based on Russian specimens. It is to be hoped that he may throw further light on these critical plants in his published writings.

\*CLADONIA FIMBRIATA f. EXILIS (Hoffm.) Crombie, Jour. Linn. Soc. Bot. **17**: 558. 1880. *C. pyxidata* \**C. exilis* Hoffm. Deutschl. Fl. **2**: 121. 1796. *C. fimbriata* var. *simplex* f. *exilis* Zahlbr. Cat. Lich. Univ. **4**: 508. 1927. On a sandy bank, North Haven (1931, det. Sandstede, not previously reported). New to North America.

The slender podetia of f. *exilis* are only 0.5–1 mm. in diameter and, in most cases, less than 1 cm. in height. They are delicate in texture and may be more or less constricted below the narrow cups. Sandstede<sup>2</sup> gives an excellent illustration of the form and expresses the opinion that it may sometimes represent a juvenile stage of development.

\*CLADONIA MAJOR (Hag.) Sandst. Abhandl. Naturw. Ver. Bremen **25**: 223. 1922. *Lichen pyxidatus* β. *major* Hag. Tent. Hist. Lich. 113. 1782. *Cladonia fimbriata* var. *simplex* f. *major* Vainio, Acta Soc. F. et Fl. Fennica **10**: 258. 1894 (as α. *simplex* α. *major*); Zahlbruckner, Cat. Lich. Univ. **4**: 509. 1927 (as var. *simplex* f. *major*). On earth. Ashford (Clark, 1933), Barkhamsted (1933), Burlington (1933), Goshen (Miss Sudbury, 1927), Killingworth (1932, 1933), New Haven (Nichols, 1912), and North Canaan (1928). The specimens from Ashford and Burlington were determined by the writer, the others by Sandstede.

The writer (p. 474) has already called attention to the chemical differences between *C. fimbriata* and *C. major*. From a morphological standpoint the two species are much alike and both produce relatively slender podetia, which broaden out gradually into distinct cups. In some cases the cups expand more abruptly in the upper part, so that the mouth flares more or less, but in most of the podetia the mouth remains relatively narrow. Both species produce farinose soredia in abundance, and the mature podetia are destitute of a cortex except perhaps at the base. The most obvious differences between *C. fimbriata* and *C. major* are differences in size. According to Sandstede's data the podetia in the usual forms of *C. fimbriata* are 1–2 mm. in diameter and up to 20 mm. in height; in *C. major*, on

<sup>1</sup> Recherches sur les Cladonies des gouv. de Penza et de Saratow 60. pl. 3, f. 8. 1917.

<sup>2</sup> In Rabenhorst, Kryptogamen-Flora **9**, Abt. 4<sup>2</sup>: 432. pl. 30, f. 6. 1931.

the contrary, they may be as much as 3 mm. in diameter and up to 40 mm. in height; the cups, in fact, may expand to a diameter of as much as 12 mm. at the mouth. The podetia of *C. major*, although normally simple, proliferate more frequently than those of *C. fimbriata*; and the cortex lining the inside of the cups, although ultimately broken up into soredia, persists longer than in *C. fimbriata*. In *C. major*, moreover, the corticate area at the base of the podetia tends to be fairly extensive and may reach to above the middle; in *C. fimbriata* the corticate area, if present at all, is restricted to the base.

CLADONIA NEMOXYNA (Ach.) Nyl. (p. 475; Notes, p. 160). Barkhamsted (1933), Canton (1933), Durham (1932), Griswold (1933), Harwinton (1933), Marlboro (1933), Portland (1933), Suffield (Smith, 1933), Thomaston (1933), Watertown (1933), West Hartford (Clark, 1932), and Wethersfield (Clark, 1933).

CLADONIA NEMOXYNA f. FIBULA (Ach.) Vainio (p. 477; Notes, p. 160). Durham (1932), Griswold (1933), Voluntown (1933), and Wethersfield (Clark, 1933).

CLADONIA CONIOCRAEA (Floerke) Spreng. f. CERATODES (Floerke) Dalla Torre & Sarnth. (p. 479; Notes, p. 160). Ashford (Clark, 1933), Burlington (1933), Canton (1933), Coventry (Clark, 1933), East Haddam (Clark, 1933), Glastonbury (Miss Sudbury, 1927, not previously reported), Guilford (Clark, 1933), Harwinton (1933), Killingworth (1933), Litchfield (1933), Middletown (1932), Simsbury (1933), Stafford (1932), Suffield (Smith, 1933) Voluntown (1933), West Hartford (Clark, 1932), and Wolcott (1933).

CLADONIA CONIOCRAEA f. TRUNCATA (Floerke) Dalla Torre & Sarnth. (p. 480; Notes, p. 160). Ashford (Clark, 1933), Bethany (M. Fulford, 1932), Canton (1933, in part det. Sandstede) East Haddam (1933), Harwinton (1933), Litchfield (1933), Middletown (1932), Portland (1933), Salisbury (1932), Stafford (1932), Voluntown (1933), and West Hartford (Clark, 1932).

CLADONIA CONIOCRAEA f. EXPANSA (Floerke) Sandst. (Notes, p. 160). Madison (1931, listed in the Notes as from Killingworth).

CLADONIA CONIOCRAEA f. ROBUSTIOR (Harm.) Sandst. (Notes, p. 161). Durham (1932), Guilford (1933), and Salisbury (1932, det. Sandstede).

CLADONIA CONIOCRAEA f. PYCNOTHELIZA (Nyl.) Vainio (Notes, p. 161). Killingworth (1933).

\*CLADONIA OCHROCHLORA Floerke, Clad. Comm. 75. 1828. *C. fimbriata* var. *ochrochlora* Vainio, Acta Soc. F. et Fl. Fennica 10: 319. 1894 (as *C. fimbriata*  $\delta$ . *ochrochlora*); Zahlbruckner, Cat. Lich. Univ. 4: 502. 1927 (as variety). On earth and rotten wood. North Haven (1931, det. Sandstede, not previously reported), Salisbury (1932), and Voluntown (1933).

The relationship between *C. ochrochlora* and *C. coniocraea* is very

close, and it is only recently that they have been specifically distinguished. Even at the present time they are still regarded by certain authors as varieties of *C. fimbriata*. The species agree with each other in many of the characters drawn from the podetia. In both species, for example, these may be either narrowly cup-forming or subulate and always produce an abundance of farinose soredia. In *C. coniocraea*, however, the sorediose area is more extensive than in *C. ochrochlora*. It involves not only most of the external surface but also the inner surface of the cups. The corticate areas, in fact, if present at all, are restricted to the basal portion and to the region just below the apothecia. In *C. ochrochlora*, on the other hand, the inner surface of the cups is corticate, the basal and subapical corticate areas are larger, and corticate patches may be scattered about in the sorediose regions.

CLADONIA BORBONICA (Del.) Nyl. f. CYLINDRICA Evans (p. 482; Notes, p. 161). Burlington (1933), Canton (1933), Cheshire (1932), East Haddam (Clark, 1932; Evans, 1933), Guilford (1933), Killingworth (1932), Litchfield (1933), Meriden (1933), Middlebury (Musch & Evans, 1929, not previously reported), Middletown (1932), Portland (1933), Simsbury (1933), Stafford (1932), Voluntown (1933), and Watertown (1933).

CLADONIA BORBONICA f. SQUAMULOSA Robbins (p. 482; Notes, p. 161). Cheshire (1932), East Haddam (1933), and Watertown, 1933).

CLADONIA PITYREA (Floerke) Fr. var. ZWACKHII Vainio f. SUBACUTA Vainio (p. 485; Notes, p. 162). Canton (1933), Coventry (Clark, 1933), Durham (1932), East Haddam (1933), Franklin (1932), Hamden (Mrs. Black & Mrs. Hobbs, 1933), Harwinton (1933), Killingworth (1933), Portland (1933), Stafford (1932), Voluntown (1933), and Watertown (1933).

CLADONIA PITYREA var. ZWACKHII f. SQUAMULIFERA Vainio (p. 485; Notes, p. 162). Colchester (1932) and East Haddam (1933).

#### Group FOLIOSAE

CLADONIA STREPSILIS (Ach.) Vainio (p. 487; Notes, p. 162). Burlington (1933), Canton (1933), Franklin (1932), Guilford (1932), Hamden (Mrs. Black, 1933), Hebron (1933), Middletown (1932), and Portland (1932). Most of these records are based on sterile specimens.

CLADONIA STREPSILIS f. GLABRATA Vainio (p. 488; Notes, p. 163). Avon (1933), Canton (1933), Cheshire (1932), Franklin (1932), Griswold (1933), Killingworth (1932), Meriden (1933), and Pomfret (Mrs. Paine, 1933).

CLADONIA STREPSILIS f. CORALLOIDEA (Ach.) Vainio (p. 489; Notes, p. 163). Avon (1933), Canton (1933), Cheshire (1932), Griswold (1933), Killingworth (1932), Wallingford (1932), and Willington (1932).

CLADONIA STREPSILIS f. SUBSESSILIS Vainio (p. 489). Wallingford (1932).

CLADONIA STREPSILIS f. MEGAPHYLLINA Harm. (Notes, p. 163). Branford (1932), Guilford (1932), and Milford (1932).

#### Group OCHROLEUCAE

CLADONIA PIEDMONTENSIS Merrill f. OBCONICA Robbins (p. 491; Notes, p. 163). East Haddam (1933), Madison (1933), and Voluntown (1933).

CLADONIA PIEDMONTENSIS f. SQUAMULOSA Robbins (p. 491; Notes, p. 163). Durham (1932), East Haddam (1933), Madison (1933), Milford (1932), and Voluntown (1933).

CLADONIA PIEDMONTENSIS f. SQUAMOSISSIMA Robbins (Notes, p. 164). Madison (1933).

*Cladonia piedmontensis* f. *lepidifera* (Vainio) Robbins (p. 491; Notes, p. 164). Durham (1932), Milford (1932), Pomfret (*Mrs. Paine*, 1933), and Wolcott (1933).

\*CLADONIA PIEDMONTENSIS Merrill f. EPIPHYLLA Robbins, RHODORA 31: 104. 1929. On earth in an old field, Milford (1932).

The apothecia in f. *epiphylla* are not borne on distinct podetia but are either sessile or short-stipitate on the primary squamules, arising from the upper surface or from the margin. The form is a homologue of the epiphyllous forms found in *C. clavulifera*, *C. subcariosa*, and other species.

At the close of 1931 (see Notes, p. 164) collections of Cladoniae had been made in 99 of the towns of Connecticut. During the years 1932 and 1933 collections were made in 20 additional towns, thus increasing the total number to 119 and reducing the number of towns still to be heard from to 50. It is hoped that this number may be still further decreased.

At the close of 1931 the number of towns to each of which 16 or more species of Cladonia had been accredited totaled 23. This number has now been increased to 39. The town standing at the head of the list is Madison, in which 37 species have been collected. This is closely followed by Killingworth, with 35 species to its credit, and North Branford, with 34. The other towns, each with 25 or more species, are the following: Old Saybrook, with 32; East Hampton and North Haven, with 28 each; Canton and North Canaan, with 27 each; and Wallingford, with 26. It will be remembered that North Canaan headed the list at the close of 1928 and North Branford at the close of 1931.

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